

Workforce skills for Industry 5.0

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Human-centred digital transitions workshop, Cedefop 2024



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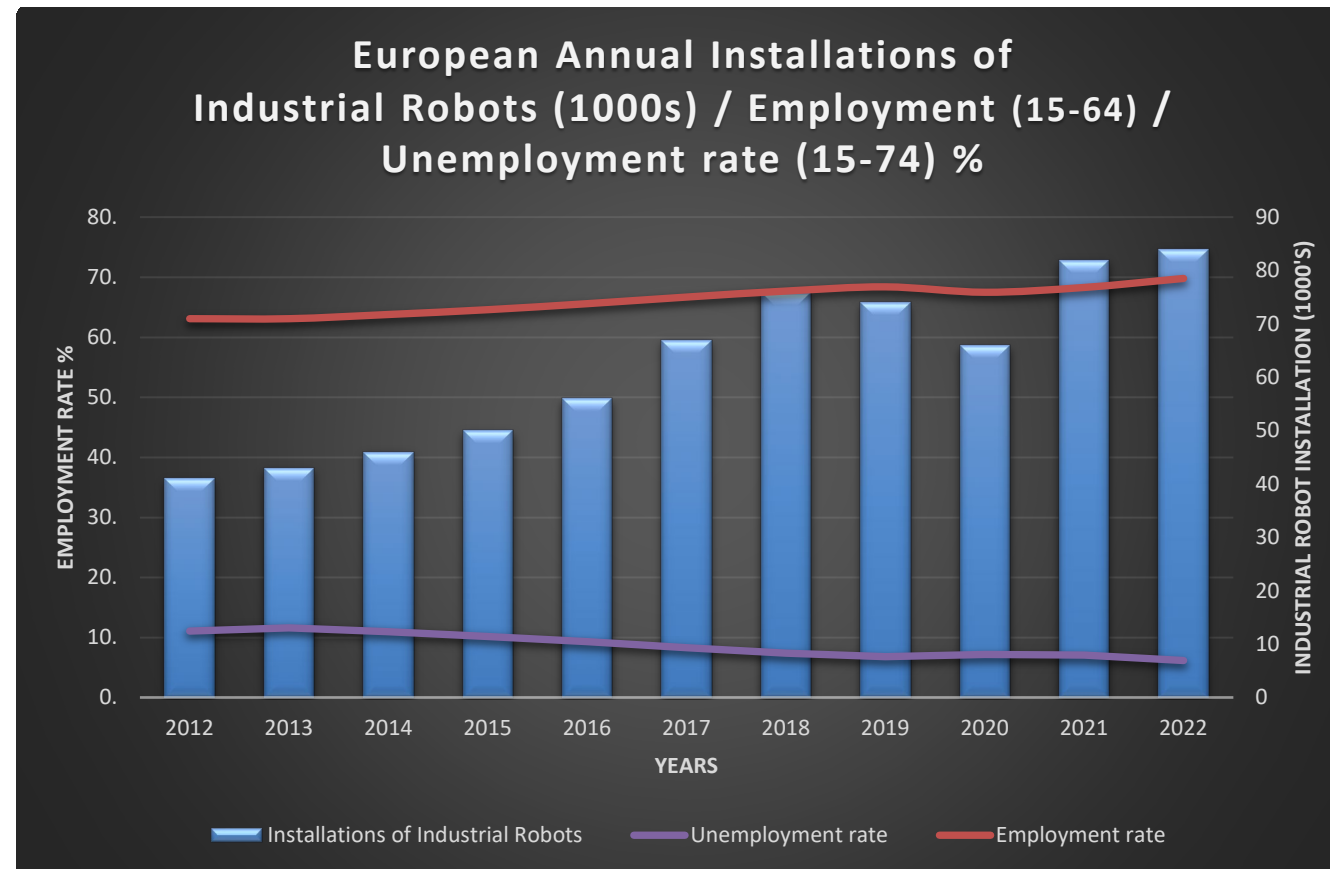
Introduction and overview

- ▶ Walk through the dual contexts:
 - Moving on from Industrie 4.0
 - The challenges to EU economy.
- ▶ Walk through what we know and what we don't know about the skills for Industry 5.0.
Structured by the 3 pillars of Industry 5.0:
 - human centredness, resilience and sustainability.
- ▶ Draw on but go beyond the work of **Bridges 5.0**, a Horizon Europe project.
 - Oeij, P.R.A., Lenaerts, K, Dhondt, S., Van Dijk, W., Schartinger, D., Sorko, S.R. & Warhurst, C., (2024) 'A Conceptual Framework for Workforce Skills for Industry 5.0: Implications for Research, Policy and Practice', *Journal of Innovation Management*, 12(1), 205-233.

Industry 4.0: opportunities and threats

- ▶ The **opportunities** arise from integrated conception, production and consumption leading to greater efficiencies and raised productivity.
- ▶ **Threat**: mass unemployment with apocalyptic claims of the substitution by technology of blue and white-collar jobs :
 - E.g. 47% of jobs disappear (Frey and Osborne 2013); then varying claims: 90% (Lever 2017) to 35% (Deloitte 2014), with variations by country and sector.
- ▶ **Problems with the claims**: the ‘evidence’ base; the weak definition; the lack of data; the ahistorical approach – ‘this time it’s different’.
- ▶ Direct and indirect empirical evidence/data reveals a different picture.
 - History lesson #1: productivity gains from new technology led to more jobs (Wilson & Buchanan 1988).
 - Firms currently shedding *and* creating jobs with new technology (Hunt et al. 2020).
 - Job numbers not dramatically effected by the introduction of the clever robots in Europe.

Robots and employment in the EU



Data sources: IFR & Eurostat

How has digital technology effected jobs #1

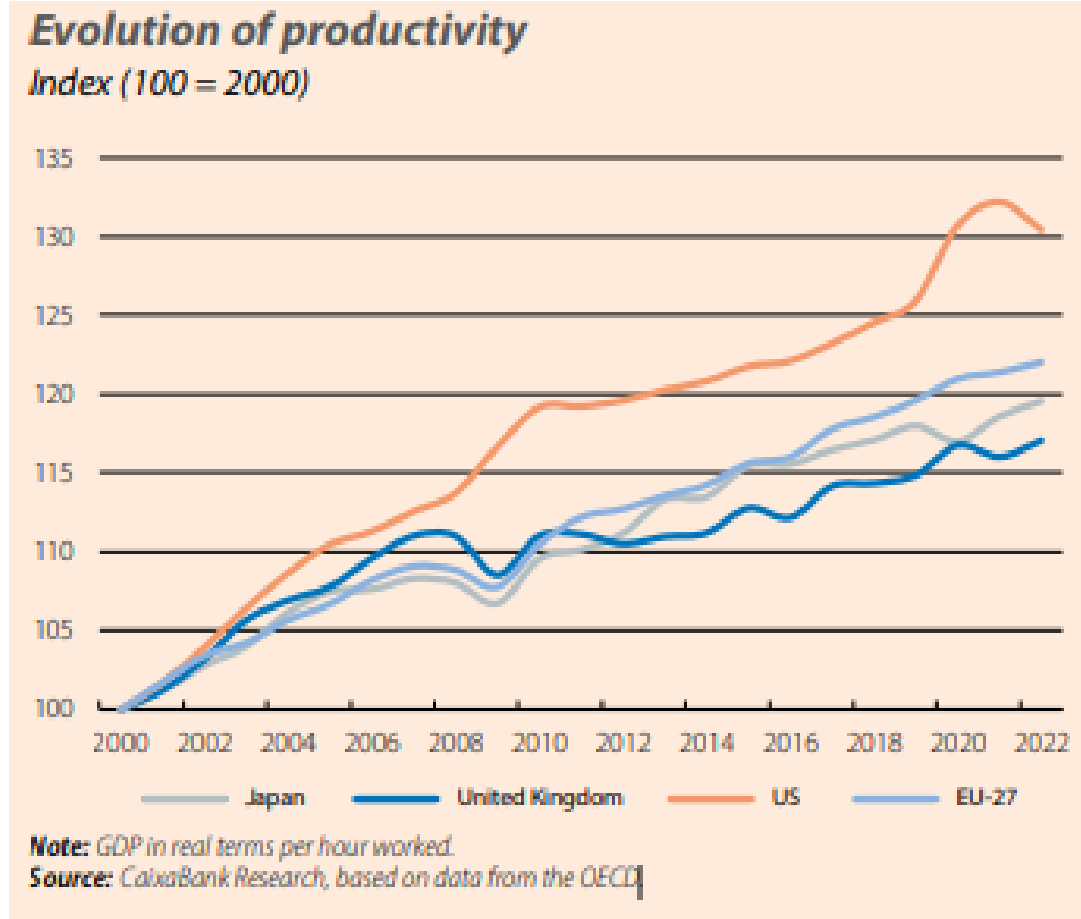
Representative survey of UK employers that had introduced AI/advanced automation in the last 5 years. (Hunt et al. 2022)

	AI for physical and/or cognitive tasks
Has the introduction of the technology created any jobs in your organisation?	
Yes	43.0
No	44.1
Don't know	13.0
Base, N (unweighted)	226
- What skill level were these new jobs created? *	
Mostly high skilled	38.9
Mostly intermediate skilled	23.9
Mostly lower skilled	9.8
A range of skills levels	27.4
Don't know	0.0
Base, N (unweighted)	98
Has the introduction of the technology eliminated or replaced jobs?	
Yes	39.9
No	48.1
Don't know	12.0
Base, N (unweighted)	226
What skill level were the jobs eliminated/replaced? *	
Mostly high skilled	29.0
Mostly intermediate skilled	17.3
Mostly lower skilled	44.2
A range of skills levels	9.5
Don't know	0.0
Total	100
Base, N (unweighted)	95

Overall, suggests more skilled jobs in the future.

Jobs also reported to be more secure in 44% of organisations; less secure in 18% of organisations.

Comparative EU productivity

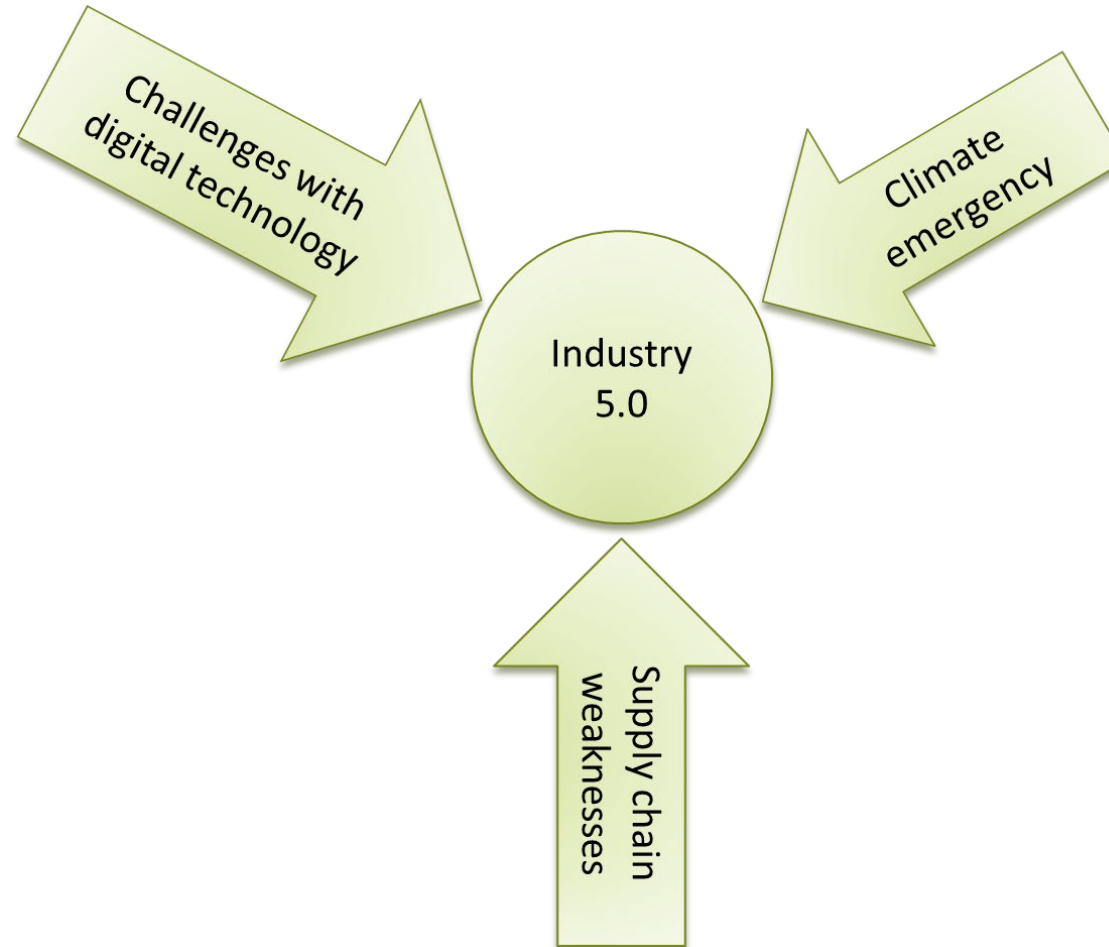


- ▶ EU **productivity low, uneven and slowing** (Aspachs & Solé Vive 2024):
 - Continues to be lower than the US.
 - It has grown over the past two decades in the EU.
 - On average it grew 1.9% per year between 2000-06.
 - But since the financial crisis, growth has slowed: between 2007-22 it averaged just 0.9% per year.
- ▶ History lesson #2: **new technology alone does not guarantee productivity gains** (Trist & Bamforth 1951).
 - Socio-Technical Systems (STS) Theory in the 1950s posited that organisations are systems in which ‘everything’, internally and externally, ‘is related to everything else’ (p.12).
 - Showed that internally organisations comprise technical and social dimensions and the two are needed to work together to maximise efficacy and productivity.
- ▶ Criticising Industrie 4.0 for being techno-centric, there have been **calls for a new STS** for the digital age (e.g. Avis 2018; Bednar & Welch 2020).

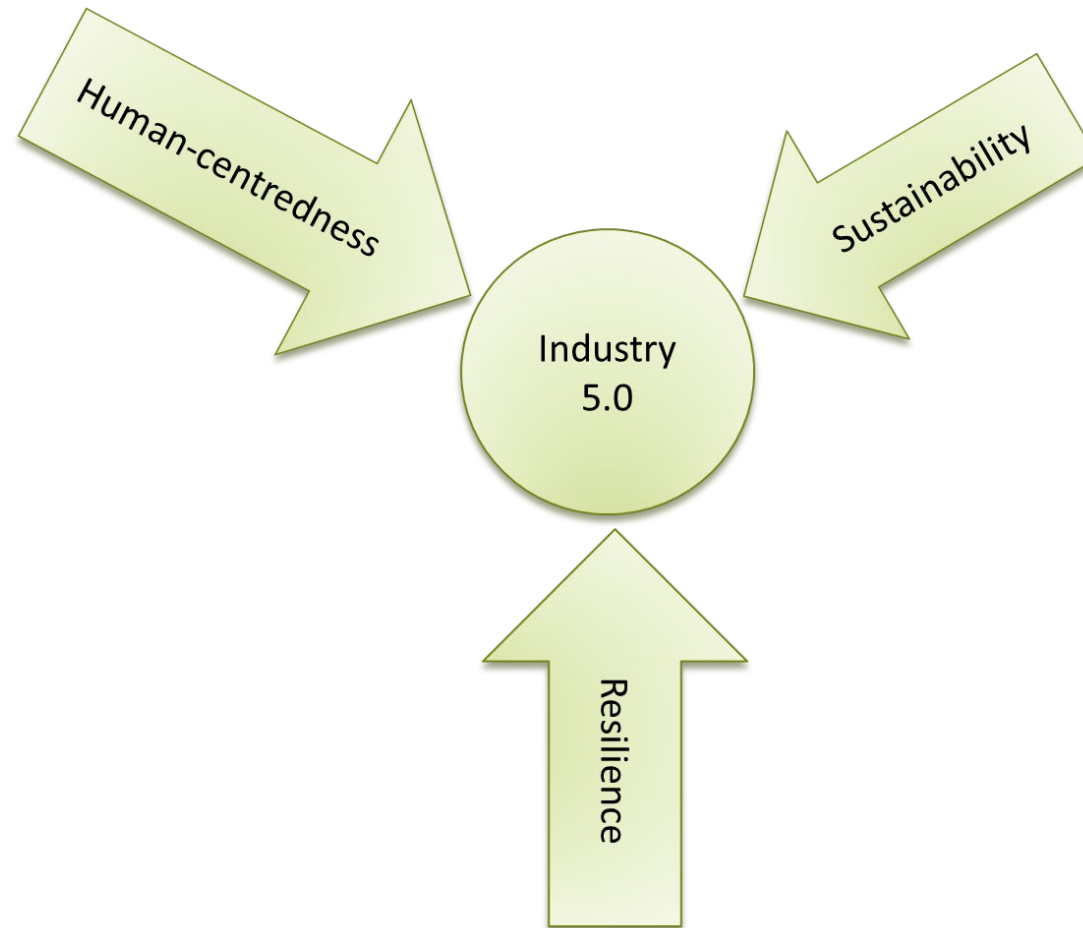
Cometh the hour ... Industry 5.0

- ▶ In 2017 German Federal Ministry of Labour and Social Affairs argued against a technocentric future. Instead, the future has to be human-centric.
- ▶ This human-centric approach has transmuted into a call by the European Commission for a new Industry 5.0. in which ‘technology serves people . . . placing the well-being of the industry worker at the centre of the production process’ (Cotta and Breque 2021: 15 & 3).
- ▶ Industry 5.0 still premised on improving efficiency but now so that both companies and workers benefit from the digital transformation.
- ▶ It goes beyond the technical and even economic to include the social.
- ▶ It is also multi-level, encompassing the work(place), organisation, industry/sector and society. An ecosystem approach, with ‘everything related to everything else’.
- ▶ It also dovetails with the EU’s Industrial Strategy and its focus on the dual transitions– digital and green.

Industry 5.0: the 3 challenges



The challenges translate into 3 pillars



What are the skills needs of Industry 5.0?

- ▶ Short answer is that we're still working it out.
- ▶ Can say that currently focused on upskilling and reskilling the workforce, reflecting the reality that there will be both new jobs and reconfigured existing jobs (EC 2023).
- ▶ But can argue that it also requires management skills but there is a real gap in understanding management skill needs – but an issue not specific to Industry 5.0 but a general EC myopia.
- ▶ The caveats:
 - Currently lack an EU dataset that links organisational-level innovation with skills and broader management and work organisation (Greenan & Silvia Napolitano 2022).
 - Existing datasets good at capturing skills possessed (cast as 'supply') by workers but weaker on development and deployment (Erickson et al. 2025f).
 - Currently experiments with 'real time' job vacancy data but not perfect (Cardenas Rubio & Warhurst 2022).

Human-centredness

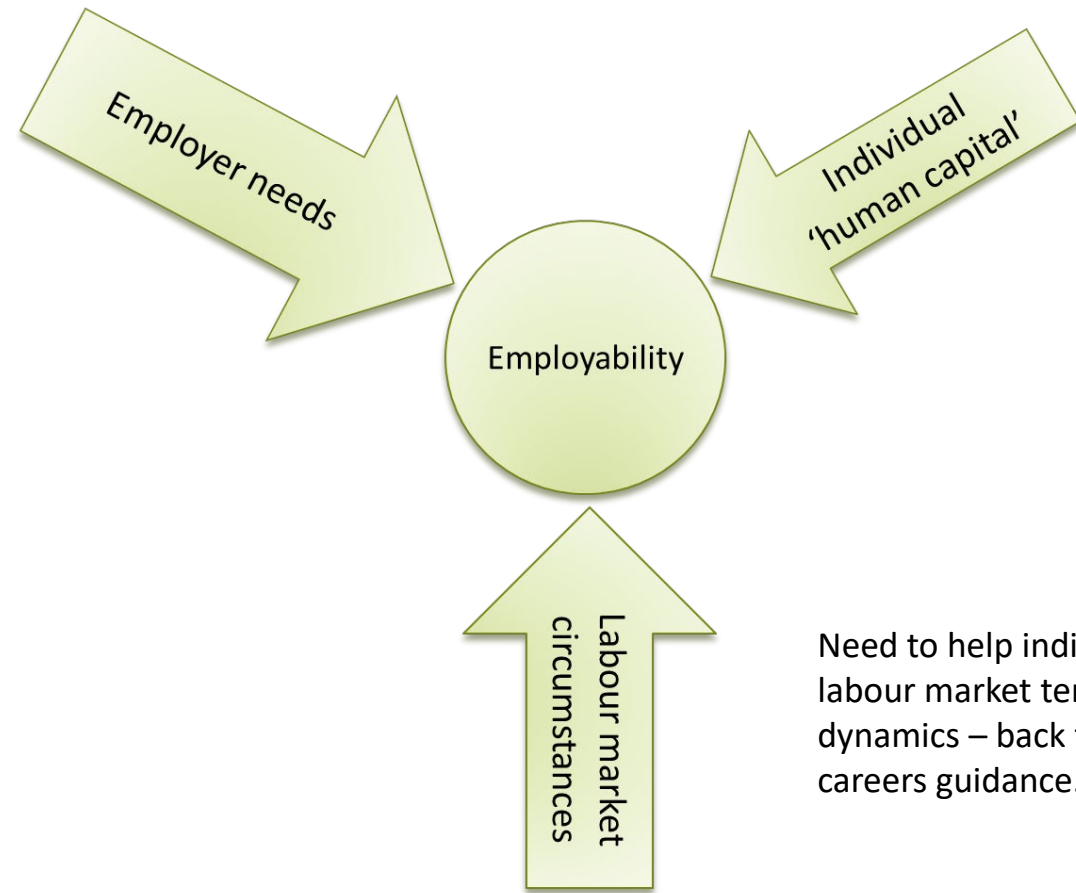
- ▶ Human centric has two dimensions: individual and social needs and practices.
- ▶ ‘Human centric’ technology **must involve workers** in the design, implementation and use of technology. It should augment/assist, not substitute humans (Acemoglu & Johnson 2023).
- ▶ Training to upskill and reskill for technological change but level is important:
 - Basic, intermediate or advanced digital skills (Kispeter 2018).
 - But **part of a bundle of other, non-digital skills**, such as analytical, social and personal skills (Barnes et al. 2025f).
- ▶ **Non-Taylorist work organisation** also important for involvement, with workers having:
 - Task level autonomy and decision making.
 - Voice and participation in task management.
- ▶ Also requires **good line management skills and engagement** – something absent in past new technology introduction (Guest 2022).
- ▶ There are training and skills needs to underpin these (collective not specifically individual) worker and line management practices.

Resilience

- ▶ Organisations need resilient supply chains and production capacity.
- ▶ Being resilient requires anticipatory capability and capability to successfully manage disruption.
- ▶ **Business and organisational development skills** required and typically the prerogative of management.
- ▶ But positive and negative accounts:
 - Negative: managing headcounts and organisational ‘dispersal’.
 - Positive: **collective capabilities** to identify and cope with vulnerabilities, and learn from the past.
- ▶ But also individual level resilience centred on maintaining ‘employability’.
 - Requires upskilling and reskilling, lifelong learning opportunities and participation, all-age careers guidance.
- ▶ But while skill possession and anticipation important, it is not sufficient for employability – that is, it’s not just a ‘supply’ issue.

Three facets to employability

Need to think about employer demand – a constantly under-addressed issue in (EU) skills policy (Erickson et al. 2025f)



McQuaid & Lindsay (2005)

Need to help individuals navigate labour market terrain and dynamics – back to LMI and careers guidance.

Sustainability

- ▶ Link to circular economy that re-uses, re-purposes and recycles products and resources.
- ▶ Along with digital skills, 'green skills' receiving most researcher and policymaker attention.
- ▶ Involves:
 - Specific industries such as those involved in renewable energy
 - But also all industries in terms of being more efficient with resources, using renewable resources
 - So need to be both product and production focused.
- ▶ Note too that some jobs that contribute to the new zero transition are not green or currently greening occupations.

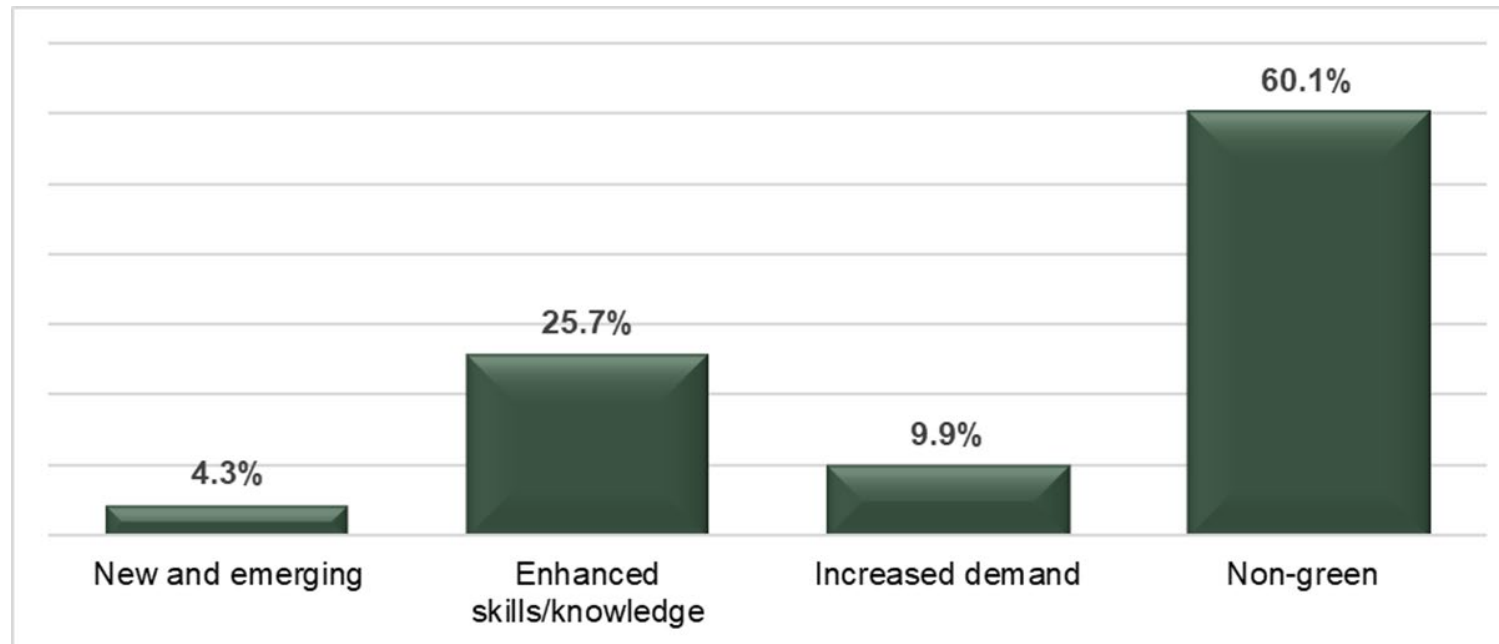
Green jobs and skills

- ▶ Analysed the extent and demand for green jobs in Scotland; a big policy push there with a climate emergency plan.
- ▶ Problem is the lack of agreed definition of a 'green job'. Developed an adapted one from US BLS/O*Net:



- ▶ Data: Labour Force Survey for extent, IER's UK Governmentfunded web-scraped job vacancy data.

The demand for green jobs



- ▶ 39.9% of all job vacancies are green jobs across the three categories.
- ▶ Most increase in Enhanced Skills & Knowledge jobs (suggests micro-credential training needs).
- ▶ Pattern repeated elsewhere within the UK (and also Sweden?).
- ▶ But not a just transition – fewer younger, older and female workers in green jobs (suggests inclusive training programmes).

'Green' skills

Beyond qualifications, e.g. CEng for a 'net zero engineer', the skills required in green jobs are not that different from other jobs (Cardenas Rubio & Warhurst 2020). These skills are a bundle of interacting skills (Barnes et al. 2025f).

Green occupations		Non-Green occupations	
Skills	Frequency	Skills	Frequency
Work as a Team	3,499	Communication	7,285
Communication	1,706	Work as a Team	4,364
Customer Service	1,296	Customer Service	2,338
Business Knowledge	1,186	Attention to Detail	2,001
Manage a Team	966	Lead a Team	1,231
Manage Work	916	Manage a Team	1,071
Provide Information	823	Person Centred Care	780
Work in Teams	759	Database	709
Financial Management	753	Accounting	631
Lead a team	645	Primary Care	563
Team Building	645	Risk Management	508
Attention to Detail	520	Project Management	490
Business Analysis	494	Specialist Nursing Care	464
Project Management	484	Surgery	440
Manage Time	480	Logistics	435
Business Processes	476	Quality Standards	403
Support Colleagues	436	Medicines	360
Contact Customers	424	Financial Management	338
Accounting	383	Manage Staff	332
Manage Business Knowledge	327	Palliative Care	309

Final reflections on skills

- ▶ The death of jobs was greatly exaggerated; indication that Industrie 4.0 might generate as many jobs and with higher skills.
- ▶ Still working through Industry 5.0; it's a constellation of values and needs in search of practical application – the task of **Bridges 5.0** in terms of skills.
- ▶ With skills for Industry 5.0, shift away from conceptualising skills as a function of the individual and/or technology and towards a socio-centric approach based on **skill as a collective capability**.
- ▶ Not just **workforce skills but management skills too** – perhaps away from human capital to organisational capital to deliver human centredness, resilience and sustainability.
- ▶ In terms of **what skills**, it's a bundle of interacting skills.
- ▶ It's often repeated but it needs repeating that it's **skill development and deployment** that matter – and having opportunity for both.
- ▶ Good news: what delivers Industry 5.0 is very familiar if sometimes underdeveloped in policy:
 - E.g. EDI; skill deployment (use) though using **joined up systems approach** within and outwith organisations.